

EMBOLANTHERA. [Greek, pitted flowers.] A small and poorly known genus, the type species is *Embolanthera spicata* from Palawan, Philippines. The latter was first collected by Foxworthy during a visit in 1906, from rocky river banks on the lower slopes of Mt. Victoria; a total of five collections are known from the type locality and from nearby Estrella Falls in Narra. It is similar to *Eustigma* in the developed perianth with parts in fives, but the petals are white in color and styles short, stigma minute. A second species was later added, *E. glabrescens* from Vietnam. Neither species was included in the molecular studies. (Not illustrated.)

❧ - *Daphniphyllum* Group - ❧

DAPHNIPHYLLUM. [Greek, laurel leaf.] The basic taxonomy of *Daphniphyllum* is well-covered in the

⁵ Huang, T. 1996. *Blumea*. 41: 231-244.

⁶ Huang, T. 1997. *Flora Malesiana*. 13: 145-168.

work of Huang^{5,6}, who reduced nearly 80 basionyms to about 20 species. These are found in mountains from S Japan to tropical Asia, often above 1000 m, but sometimes at 500 m. The genus is distinctive in the lack of petals, pendulous ovules, copious endosperm, and minute embryo. The leaves lack stipules, and the seed seems to be close to Buxaceae. The chemistry is also exceptional and has created an extensive literature related to the search for valued alkaloids. The leaves accumulate aluminum, and the plants are dioecious. Much diversity is lumped under a broadly conceived species, *D. glaucescens*. It can exceed 20 cm DBH or grow as a small shrub.

These odd plants may be mistaken as a Lauraceae because of the want of stipule and long leaf stalk. However, the leaf stalk varies in length as in Euphorbiaceae and is not tapered from the base; the venation is also not at all like Lauraceae. Both *D. calycinum* and *D. glaucescens* are illustrated in THROWER *loc. cit.*



MYRTALES

The Myrtales include herbs, lianas and trees, essentially tropical in distribution, and with a diversity, following STEVENS *loc. cit.*, of 11 families, 380 genera, and 11,000 species. The cladogram below is drawn from the latest molecular study¹ and from STEVENS *loc. cit.*, although with a slightly different linear order¹. Additional studies are cited under each of the families.

The order is notable for including *Syzygium* (Myrtaceae), the most species-rich genus of Asian trees and the source of numerous fruits as well as cloves; for *Lagerstroemia* (Lythraceae), the ecologically critical genus of dry seasonal forests; and for *Memecylon* (Memecylaceae), abundant trees of the forest understory. The order also includes the world's tallest flowering plant, *Eucalyptus regnans* of Australia. Much of the order comprises woody plants with leaves that are opposite and blades that are pinnately nerved. However, spirally arranged leaves are found both in *Terminalia* and many leptosperms of the Myrtaceae, and three-nerved blades are found in Myrtaceae (*Rhodamnia*) and especially in the Melastomataceae.

Myrtales are also distinguished by the many 'bark' genera, that is, genera with a form of bark that is distinctive and often diagnostic to species and sometimes to genus. Not found among the trees of this important order are genuinely palmately lobed or palmately nerved leaves, nor do we find strong stipules. However, some sort of small elaboration at the node is evident on the youngest leaves. Leaf stalks are usually short, uniform, without pulvinus, and the plants lack exudate of any kind. Few vegetative parts have any sort of odor. The flowers are often with parts in fours, the calyx valvate, with a more or less inferior ovary, the stamens are typically twice the number of calyx lobes and incurved in bud, the ovary with numerous ovules and a single style.

With regard to ecology, the Myrtales are very mixed. Many species have dry fruits and small seeds and are prevalent in dry places. *Syzygium* bear fleshy fruits and are most common in the lowland equatorial forest. A large fraction of the Myrtales prefer a combination of full sun and wet ground, habitats such as riverbanks, swamp forests and sandy coasts: *Tristaniaopsis*, *Terminalia*, *Anogeissus*, *Duabanga*, and *Dactyloctenium*. A related preference in habitat can be seen in the many important species of mangroves: *Lumnitzera*, *Sonneratia*, *Pemphis*, and *Osbornia*.

¹Sytsma, K, *et al.* 2004. *International Journal of Plant Science*. 165: S85-S105.

Phylogeny of Myrtales

Family	Diversity & Distribution	Trees of Tropical Asia
Combreteaceae	20/500, pantropical, especially Africa.	4/30, especially <i>Terminalia</i> , plus lianas in <i>Combretum</i> , the mangrove <i>Lumnitzera</i> .
Onagraceae	22/656, herbs, worldwide.	0.
Lythraceae	31/620, herbs and trees, more or less global.	4/80, especially <i>Lagerstroemia</i> .
Myrtaceae	129/4620, woody, pantropical and warm climates.	13 genera and over 300 species, especially <i>Syzygium</i> .
Vochysiaceae	7/190, woody, American-African.	0.
Melastomataceae	182/4570, some herbs, mostly small woody, especially shrubs of tropical America.	Modest number of herbs and lianas; among trees, 12 genera and about 50 species, only <i>Pternandra</i> over 10 cm DBH.
Memecylaceae	6/435, pantropical, woody,	2/100, common, abundant.
Crypteroniaceae	3/10, Asia, warm tropical.	3/8.
4 families	African, 1 American tropics.	0.



ROSIDS: MYRTALES

COMBRETACEAE

NAMES: From the genus *Combretum*, as below.

OVERVIEW: Maybe 500 species in 20 genera, especially tropical Africa, and *Terminalia* more or less pantropical. In Asia, we find four genera of trees represented by about 30 species, most of these in the genus *Terminalia*. The family is somewhat diverse in vegetative form, including both lianas and trees. The leaves are simple with entire margins and short stalks; the arrangement either opposite or spiral. Although the node lacks any trace of a stipule, the leaf-base sometimes bears two gland-containing flask-shaped cavities. The entire body is without odor or exudate.

The inflorescence is typically a raceme. The flowers are small, regular, the parts in fours (three to eight), with a distinct calyx and corolla, (sometimes absent), imbricate or valvate. The androecium is exclusively of fertile stamens, five or twice the calyx lobes. The ovary is of two to five fused carpels, inferior, with a single cell and a single style, the ovules few (two to six) and pendulous.

The family shows a strong tendency toward habitats that combine full sun, wet ground and disturbance of one sort or another. I might note the mangroves *Lumnitzera* and *Laguncularia*, the thorny *Anogeissus* often near rivers in strongly dry seasonal forests, the fast-growing *Combretum quadrangulare* along waysides and now used for early land restoration, and *Terminalia* with its many species of swampy forest gaps as well as the ubiq-

uitous littoral species, *T. catappa*. Their tendency toward water-dispersed fruit might also account for the wide distribution of most genera - few of the 20 genera are restricted to a single continent.

In addition to the genera below, I might also mention *Quisqualis indica*, which is a sprawling scrambling low liana, rarely more than a shrub, but especially conspicuous in dry seasonal places on account of the fragrant and colorful flowers.

FIELD RECOGNITION: *TERMINALIA*

Medium to large trees, forest margins, gaps, especially wet ground, river banks; larger trees with plank buttresses, *T. phellocarpa* with pneumatophores.

Bark thin, flaking, twig and trunk without exudate.

Spirally arranged leaf clusters with 'terminalian' branching is common, but also some with sub-opposite leaves.

The blade is entire, oblanceolate or elliptic, the stalk unswollen or somewhat tapered toward the apex, sometimes weak pellucid dots but commonly with a pair of glands at the junction of blade and leaf stalk. Also domatia are common in the nerve axils.

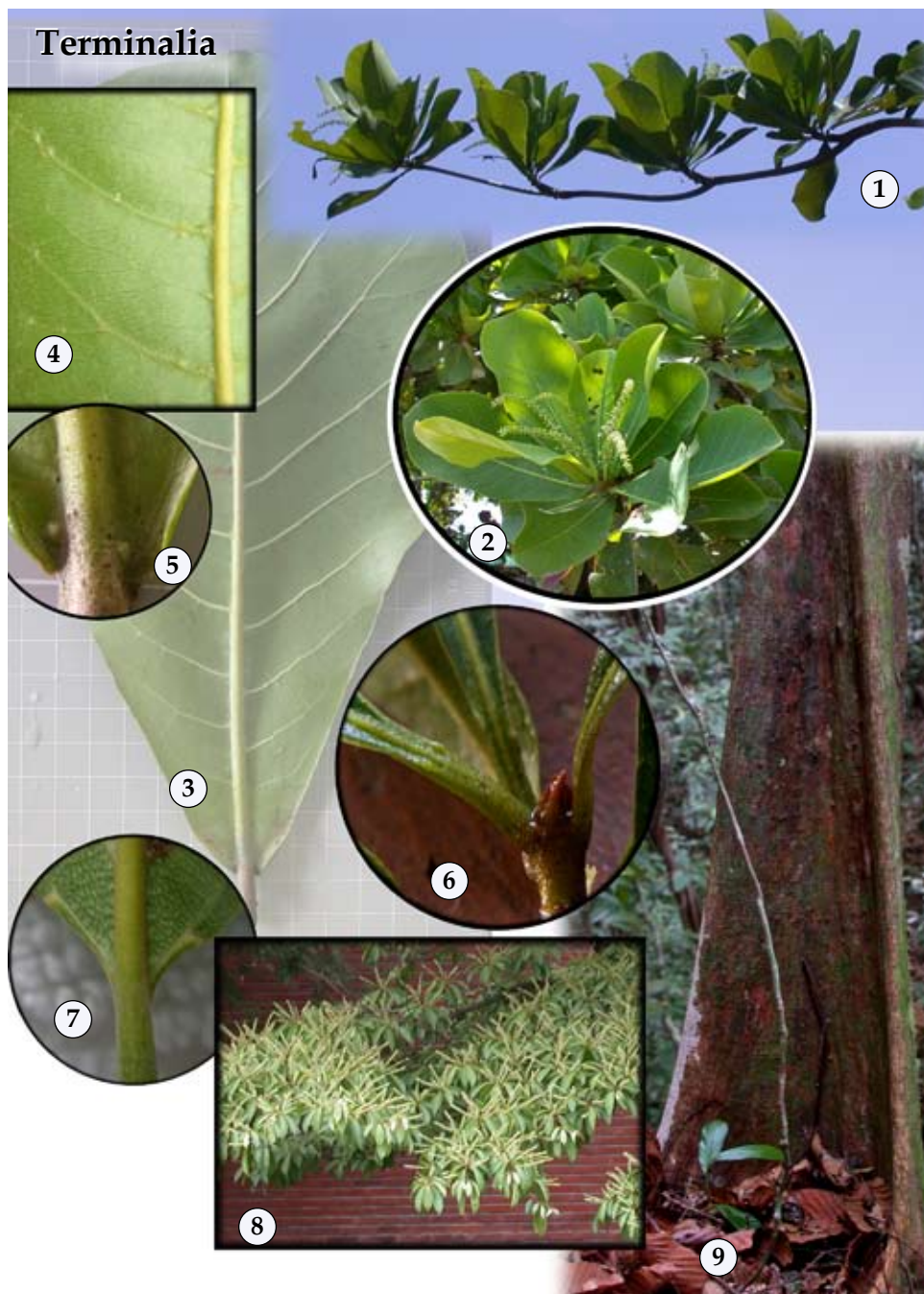
The indumentum is chiefly simple hairs, adpressed, often with crystalline excretion or a basal crystal, obvious in the dry leaf.

Growth and flowering typically in seasonal flushes.

FIELD CONFUSION

Barringtonia has at least a hint of teeth in the upper margin, and lacks the paired glands at the base of the leaf.

Elaeocarpus has a pulvinate leaf stalk, teeth in the upper leaf margin, often resinous twig apex, often pimpled blade.



Terminalia. 1-5, *T. catappa*; 1, terminalean habit, spirally arranged upturned clusters of leaves with a branch continuing from an old leaf scar below the leaves; 2, the inflorescences are mostly few-branched spike from amidst the leaves, in *T. catappa*, more or less continually flower; 3, short leaf stalk and large blade with strong regular pinnate nerves; 4, small pocket glands in the axil of the main nerves; 5, a pair of glands at the base of the leaf; 6-7, other examples of the paired glands in other species of *Terminalia*; 8, episodic flowering of *T. citrina*, Philippines, nearly every branch with floral spikes; 9, the large narrowly buttressed trunk of *T. spathulata*, an isolated tree in an old forest gap, swampy forest in Malaya.



Terminalia. 1-4, *T. catappa*, Philippines; 1, staminate flower from a short floral stalk; 2, the stalkless bisexual flower with the inferior ovary; 3-4, the single-seeded fruit, water dispersed; 5-6, *T. cf. franchetii*, Vietnam; 5, flowers and winged fruit.



Terminalia bellerica, Thailand, leaf and trunk of an abundant and characteristic large forest tree.

TERMINALIA. [Linnaean name in reference to vegetative habit.] A pantropical genus of maybe 150 species, maybe 25 in tropical Asia, although sparse, with maybe eight in Borneo, eight in Malaya, MERRILL *loc. cit.* records 13 species in the Philippines. Many of the species are widespread and shared throughout tropical Asia. Although the name *Terminalia* denotes the most conspicuous feature of many of the species, that is, the upturned cluster of spirally arranged leaves with conspicuous branches from below each cluster, remember that more than a few species bear opposite or sub-opposite leaves. The preferred Malay for the forest and swamp species is *jelewai*, while in Borneo the Iban names *telinsi* and *kedandi* are well known.

Terminalia catappa, is a large pagoda-shaped tree, found everywhere in tropical Asia. Native to coastal forests, it has become one of the most widely planted shade trees in all towns and villages. The Malay is *ketapang* from which the specific epithet is taken. The standard name in the Philippines is *talisay*, although the English umbrella-tree is equally common. The seeds bear an edible kernel, a favorite with children. Although the fruit seem to be well adapted for ocean dispersal, they are also readily taken by bats, the thin husk chewed off, and the seed dropped. Other species of *Terminalia* show varied

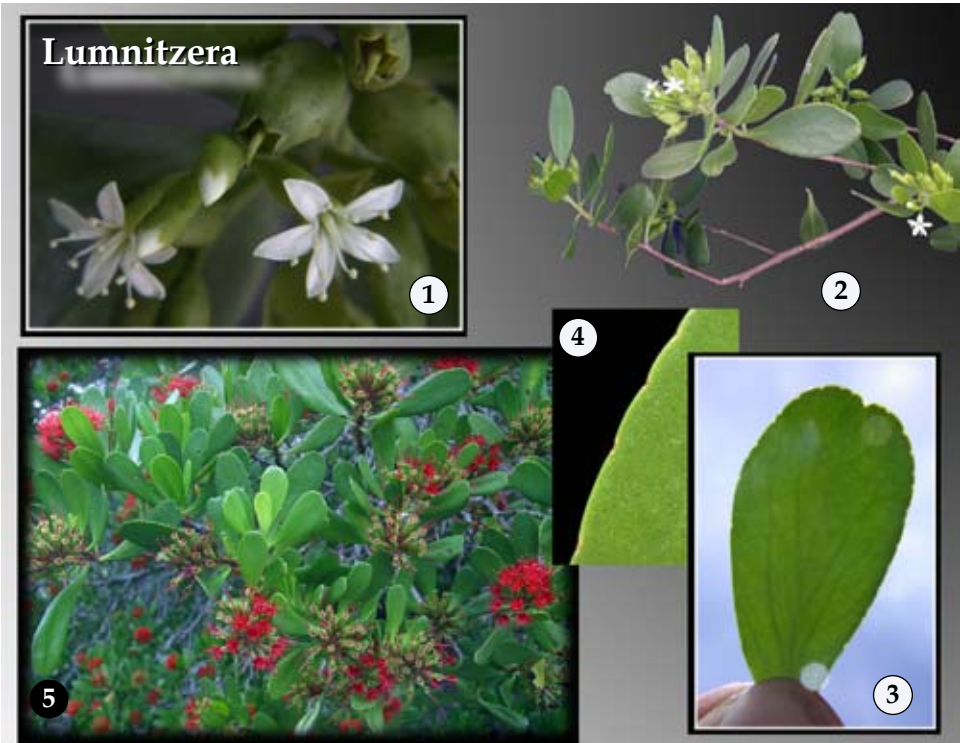
modes of dispersal: corky floating fruit in *T. phello-carpa*, winged and evidently wind dispersed fruit in *T. calamansanai* and *T. subspathulata*.

These trees seem to me to belong to seasonal lands and ruderal environments of ocean shores, mangroves, riversides and associated swamp forests. They seem not at home in the deep lowland everwet rainforest. Where they occur in such places, they are often isolated and seem to have recruited in an earlier gap. At Lambir Hills Sarawak, we counted only four species and a total of fewer than 100 trees in 52 ha; and in Pasoh in Malaya we found three species and less than 50 trees in 50 ha. Wherever they grow, they are more or less strongly deciduous, often leafless for a few weeks even in the wettest places.

LUMNITZERA. [Commemorates Istvan Lumnitzer, d. 1806, Hungarian botanist.] A genus of two species throughout Asia-Pacific mangroves, one of which reaches west to E Africa. The common names include *teruntum* (Sarawak); *geriting* (North Borneo); *tabau* (Philippines). These trees are reported to reach 30 m in height, but they flower at small sizes, and often are found as much-branched shrubs. The twigs are red and bear stalkless leaves. In fact, the leaf blade appears as if it were little more than a flattened leaf stalk, with the youngest leaves curled along the margins to protect the apex. The blade bears conspicuous



Anogeissus acuminata, along a river in the lowlands of southern Vietnam; the leaves opposite to subopposite, the mature trunk usually with short spines.



Lumnitzera. 1-4, *L. racemosa*; 1, flower; 2, flowering branch; 3, leaf blade, backlit to show the venation; 4, the blade backlit to show the dot glands and marginal glands; 5, *Lumnitzera littoralis* bears red flowers. (Photograph 5 © Leonardo L. Co.)

marginal glands; the roots with pneumataphores. The fresh wood supposedly has the strong fragrance of roses.

TOMLINSON *loc. cit.* suggests that the two species differ in pollinators and also edaphic preferences. *Lumnitzera littoralis* prefers saline muddy spots in back mangroves, and bears red flowers; *L. racemosa* is found in more sandy and less fertile shores, and bears white flowers.

ANOGEISSUS. [Greek, upward-tile, reference to the flattened two-winged fruit.] A genus of eight species found in the Paleotropics, from Africa (1) and the southern Arabian Peninsula (2), to South Asia (five) and east to Mainland SE Asia but not farther to the east or south. Among the several species, the leaves vary in arrangement from opposite to subopposite or alternate.

Many of the trees are weakly thorny. The flowers are in axillary heads, the petals absent, stamen number 10, the fruit is dry, ridged or winged, with a persistent calyx tube. *Anogeissus latifolia* is extensively planted in India as a source of medicinal gum. The most common species in Mainland SE Asia is *A. acuminata*, which is particularly abundant along rivers and increasingly planted in cities, especially in Vietnam. The leaves here are mostly small and opposite, the trunk usually spiny. As with other species of *Anogeissus*, it is popular in traditional medicine.

COMBRETUM. [A classical name used by Pliny for an unrelated species.] A genus of large stout lianas with one species, *Combretum quadrangulare* sometimes as a small tree. (Not illustrated.)



ROSIDS: MYRTALES

LYTHRACEAE

NAME: From the genus *Lythrum*, perennial herbs of Europe and America, the name from Latin for blood, probably in reference to the color of the flowers in some species.

OVERVIEW: A family of moderate size with about 600 species in 30 genera, more or less pantropical, relatively well-defined and strongly monophyletic if taken in the broadest sense, that is, to include *Sonneratia* and *Duabanga*. Molecular studies demonstrate the integrity of the family while rejecting the traditional intra-familial groupings^{1,2,3}.

The family includes trees, shrubs and herbs of the full sun, chiefly of places that are strongly seasonal or wet, or both. It includes *Lagerstroemia*, the critical species-rich genus of the dry-seasonal forests, the important mangrove *Sonneratia*, the abundant tree of roadsides and secondary forests *Duabanga*, and the small tree of rocky and sandy coasts, *Pemphis*. In contrast, it lacks shade-tolerant species and is entirely unimportant in the equatorial everwet forests.

The trees can be generally characterized as follows. The bark is flaky or patchy or otherwise distinctive. Young twigs are somewhat winged or four-ridged, and bear leaves that are always simple and opposite with short stout stalks. There is no sign of a well developed

stipule, although, as in many Myrtales, we might find small glands at the nodes nearest the twig apex. The mature node is without the clear intrapetiolar scar such as is found among the melastomes. The blade bears pinnate nerves, and is without dot glands. The flowers are variously arranged in terminal open inflorescences, colorful but without scent, bisexual, radially symmetric, sepals one half or less the length of the floral tube; petals, inserted on the inner rim of the floral tube, alternating with the sepals, crumpled, frequently clawed, stamens inserted near the base of the floral tube, anthers introrse, bilocular, longitudinally dehiscent. The gynoeceum is syncarpous, encircled at the base by nectariferous tissue; style simple, slender, exerted; the calyx tube encloses the ovary to varying degrees, leading together superior or inferior condition; locules number three or four, or sometimes many, the ovules two-many per cell. The fruit is a characteristic dry capsule enclosed by the persistent floral tube, and the seeds may be winged or not. Our genera are few, and distinct such that field recognition is to the genus rather than the family.

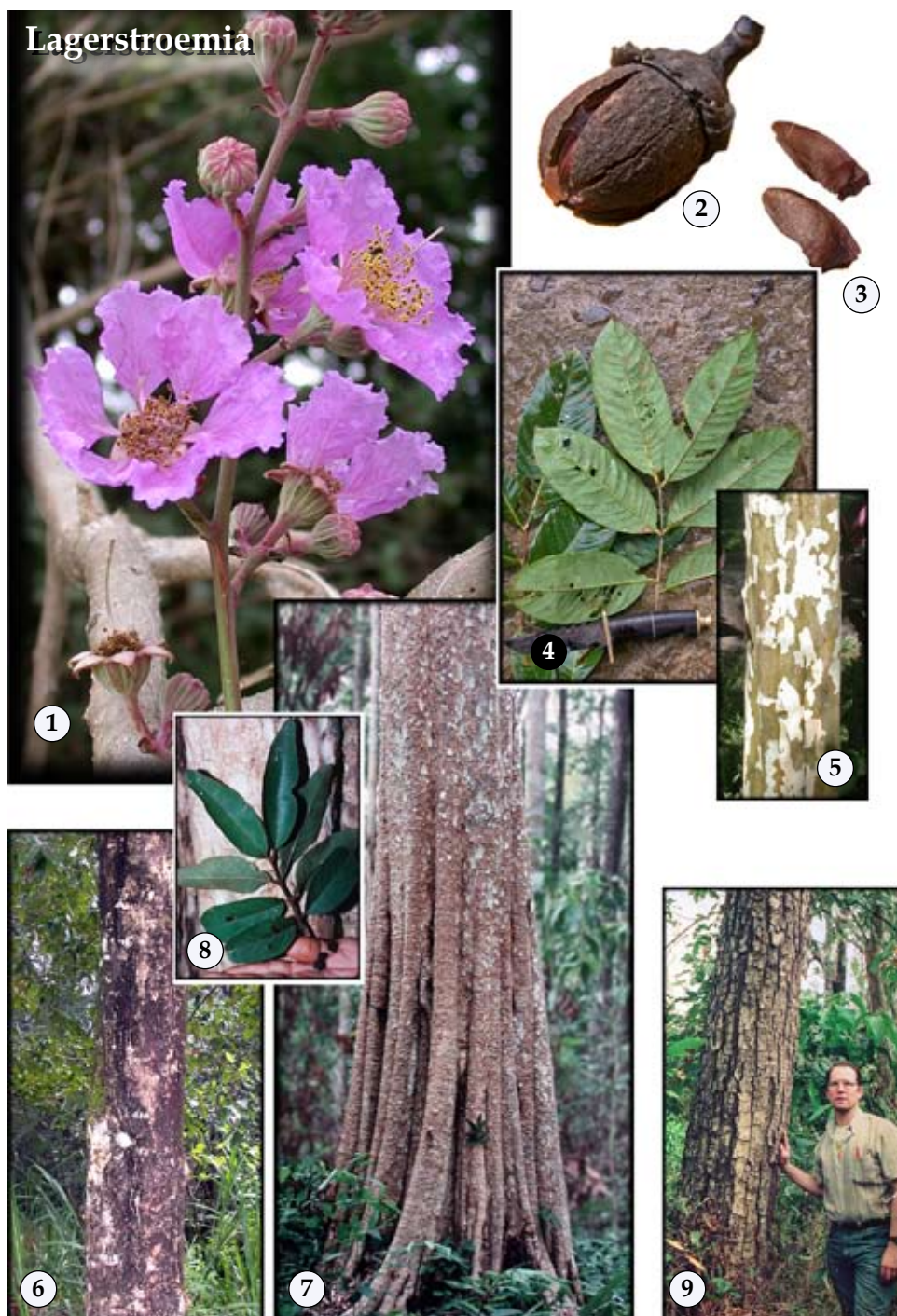
LAGERSTROEMIA. [Magnus von Lagerström, a Swedish collector for Linnaeus.] *Lagerstroemia* is a genus of about 70 species found in temperate to tropical Asia, chiefly from India to China and Mainland SE Asia, south and east of which the representation is sparse: six in Malaya but chiefly in the north, only *L. ovalifolia* scattered southward; *L. piriiformis* is patchily common in dry forest in the Philippines, where a few other rare species are claimed. *Lagerstroemia archeriana* is restricted to Australia. The Malay name for *Lagerstroemia* in general is *bunga*, while in the Philippines the preferred name is *banaba*.

Most species of *Lagerstroemia* are medium to large canopy trees. The leaves are basically opposite but some-

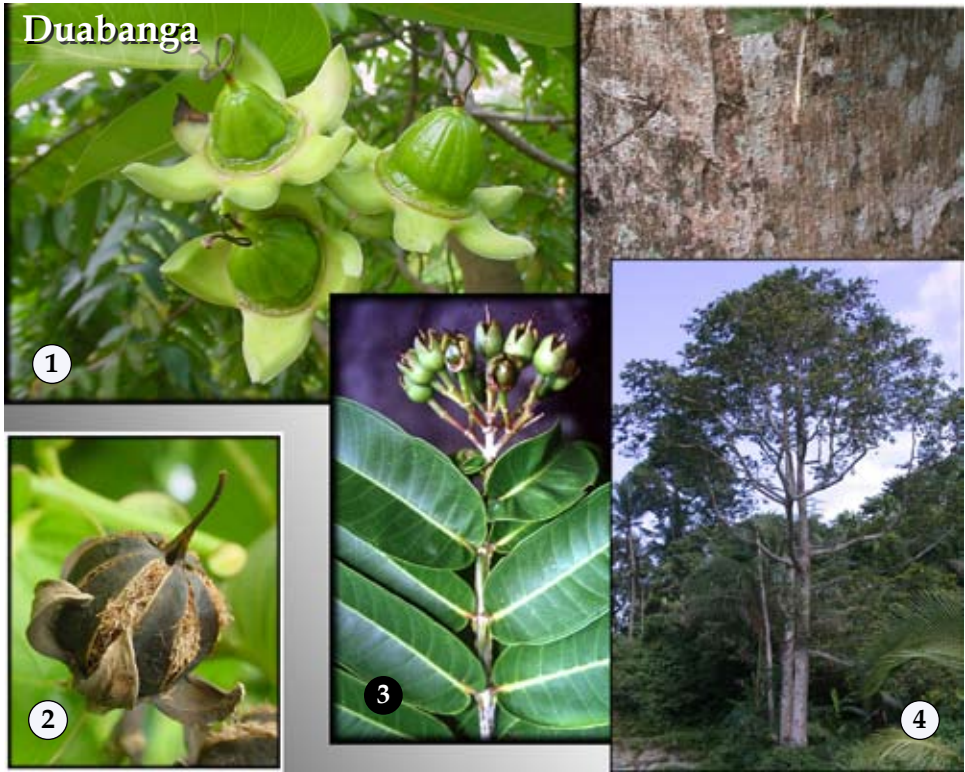
¹Shi, S, *et al.* 2000. Journal of Plant Research. 113: 253-258.

²Huang, Y, *et al.* 2002. International Journal of Plant Science. 163: 215-225.

³Graham, S, *et al.* 2005. International Journal of Plant Science. 166: 995-1017.



Lagerstroemia. 1-3, *L. speciosa*, cultivated in the Philippines, characteristic are the crinkled petals, numerous stamens, exserted style, ribbed buds and calyx tubes; 2, the mature fruit, about 3 cm long, a dry capsule with persistent calyx and splitting valves; 3, winged seeds, about 3 mm long; 4, *L. tomentosa*, Vietnam, opposite to sub opposite leaves; 5-9, variation in the form of bark and trunk, at roughly the same scale; 5, a form of *L. tomentosa*, cultivated in Ho Chi Minh City, Vietnam; (6-9, from Huai Kha Khaeng, Thailand) 6, *L. balansae*; 7, a large tree of *L. calyculata*, with characteristic fluted bole and pocked bark, the twig sample is seen on the side of the tree and enlarged (8); 9, *L. villosa* with thick and deeply fissured bark.



Duabanga. 1-2, *D. grandiflora*, Singapore; 3-5, *D. moluccana*, northern Luzon, Philippines, note the 4-winged twig. (Photographs 1-2, © Joseph Lai; 3, © Leonardo L. Co.)

times they vary in exact position along the twig to sub-opposite or nearly alternate. The twigs of juveniles and sucker shoots are often winged. The flowers are often large with crinkled violet petals, arranged in open panicles, spreading and branched. In some species the flowers are small and white and the inflorescence is more condensed. Pollination is presumed to be by strong-flying bees. The fruit is a dry capsule, the seeds are small, with weak wings and dispersed by wind.

The ecological significance of *Lagerstroemia*, in both species numbers and abundance, is far greater in India and Mainland SE Asia than anywhere else. One or more of the species is often a major component of all dry-land forests, especially the lowland semi-evergreen and deciduous forests, and especially riversides and gallery forests. How surprising it is then to discover the poverty of our general knowledge of these species, their description, habitats and reproduction, even their names. While the most recent revision of the genus in Asia⁴ cannot be faulted in any technical sense, it was based almost entirely on herbarium specimens. *Lagerstroemia* demands field study, perhaps more than any other major genus of trees in the region. The flowers are

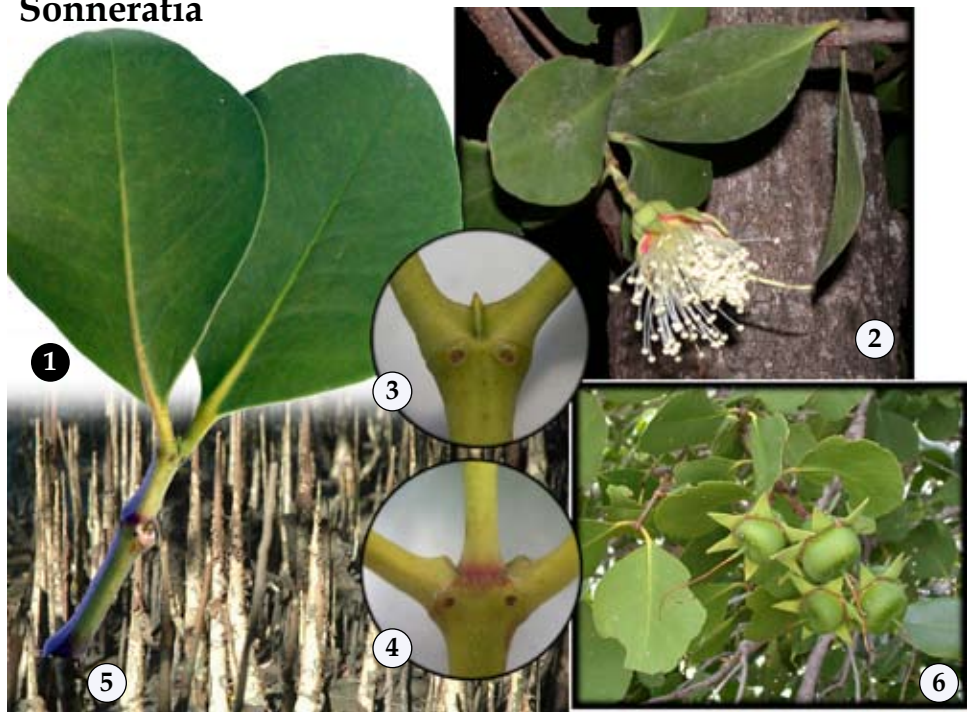
so fragile that they make exceedingly poor specimens, while the fruit varies with maturity in most of the critical details used in the taxonomic keys. Furthermore, the leaves vary in size and indumentum with maturity, and also vary along the branches of a single tree, and are often very different when taken from coppices. Lastly, and most significantly, the features of the mature bark are a rich source of untapped information, details unmentioned in most descriptions.

Two species of Indian origin are cultivated everywhere in the tropics and warm parts of the globe. The Queen crape myrtle is *Lagerstroemia speciosa* (commonly under the synonym *L. flos-reginae*), a medium-size tree. The crape myrtle is a smaller multi-branched shrub, *L. indica*. Many of the cultivated forms of *Lagerstroemia* are hybrids between *L. indica* and *L. fauriei*. In recent decades, *L. tomentosa* has become increasingly popular in Asia as a cultivated species.

DUABANGA. [After an Indian name.] A genus of two species restricted to Asia. *Duabanga grandiflora* is found in Mainland SE Asia southward in the Malay Peninsula. It is distinguished by a calyx with five-eight pointed lobes. The second species is *D. moluccana* of Borneo and lands east and north, distinguished by four calyx lobes. A third species, *D. taylorii*, may be a hybrid

⁴Furtado, C., et al. 1969. A revision of *Lagerstroemia* (Lythraceae). Gardens' Bulletin (Singapore). 24: 185-335.

Sonneratia

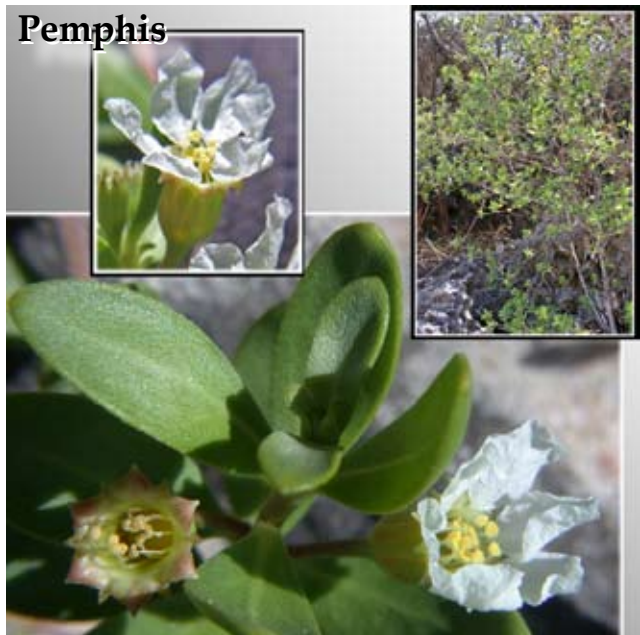


Sonneratia alba. 1-5, Hundred Islands National Park, Philippines; 1, thick rounded blades from short thick leaf stalks, opposite decussate; 2, the flower without petals, the stamens numerous, opening after dark in a powder-puff display, bat pollinated; 3, the twig apex hidden and protected by the clasping base of the leaf stalk, a pair of stipule-like glands associated with each leaf; 4, the exerted twig with a scar; 5, dense pointed pneumatophores surround the patches; 6, in fruit, Palawan, Philippines. (Photograph 5, © Leonardo L. Co.)

of the two, perhaps originated in the Bogor Botanic Garden in the 1850s. The Malay name for the genus is *berambang-bukit*, the Iban *sawih*.

In habit, these trees are recognized by the long drooping branches with new leaves that flush red. They might be mistaken from afar for *Neolamarckia* (Rubiaceae) on account of the habit, habitat, and the broad opposite leaves, but the twig here is four-angled, and there is a ridge between the petioles, not a well-developed stipule. *Duabanga* are fast growing light-wooded trees and indicators of rich damp soils, especially prevalent along sunlit river banks and exposed alluvium. They were long thought to be the dry-land relative of the mangrove species of *Sonneratia* - the two often linked within the family Sonneratiaceae - but the molecular studies cited above demonstrate the falsity of the claim and that the

Pemphis



Pemphis acidus, Hundred Islands National Park, Philippines; growing on the raised coral beds overlooking the ocean.

relatives of *Duabanga* appear to be found in the ancestry of *Lagerstroemia*.

SONNERATIA. [Commemorates Pierre Sonnerat, French collector, explorer of Asia.] *Sonneratia* includes eight species of Paleotropical mangroves, six of which are found in our area. These small dense trees can become exceedingly abundant, and form one of the main components of the mangroves along much of the coast. They are multi-stemmed shrubs or trees, with strong pneumatophores. The flowers are wonderful big powder puffs, the buds swell and open in the evening; the style emerges first, as the calyx opens the stamens spring out and a strong odor is emitted. The flowers are visited by nectar-loving bats that drink the sweet juice that fills the calyx cup. Each flower lasts a single night. The different species of *Sonneratia* have reportedly very different phenologies, that is, different temporal patterns of flowering. Since hybridization of *Sonneratia* is well demonstrated in general, it would be a good group to study the complex relationship among sequential flowering, pol-

linator competition, reproductive isolation and speciation. These mangroves include the famous 'firefly bushes' of the Selangor River in Malaysia and elsewhere. The fire flies (*Preropyx tener*) congregate and blink, each shrub in its own synchrony, like so many Christmas trees. *Sonneratia* leaves are the preferred food of the Bornean Proboscis Monkey (*Nasalis larvatus*).

PEMPHIS. [Greek, swelling, in reference to the fruit.] A genus of two species, one in Madagascar, and *Pemphis acidula*, widespread in tropical Asia as a small tree of coasts and mangroves. The flowers are of two kinds with either short or long styles. Petals are white to pink, stamens 12, fruit is three-carpelate. These small trees with thick fleshy leaves are common on rocky coasts. They are evidently very long-lived, and the wood is very hard. The twisted and gnarled trunks sprout repeatedly with fresh foliage. That habit makes *Pemphis* one of the favorites of *bonsai* enthusiasts of Asia, who, while making magnificent potted displays from these trees, perhaps too often gather the ancient plants from the wild.



BASAL ROSIDS: MYRTALES

MYRTACEAE

NAME: From the genus *Myrtus*, based on the ancient Greek name for a myrtle.

OVERVIEW: The Myrtaceae are a difficult family, both in species-level biology and in the broader organization of genera and their alliances. The family is traditionally divided between the Myrtoideae and the Leptospermoideae. The former are fleshy fruited trees with opposite leaves, comprising especially the large genera *Eugenia* of the Neotropics and Africa, and *Syzygium* of Asia. The subfamily Leptospermoideae, with a center of richness in Australia, differs in the mostly spirally arranged leaves and dry capsular fruit. The latter subfamily is apparently paraphyletic, the former nested within. The two great genera of trees with fleshy fruits, *Syzygium* and *Eugenia*, each genus with over 1000 species, are now thought to

be independently derived, despite a superficial similarity that for a century led to their combination as single vast and bewildering genus. The family is currently taken as comprising 129 genera and 4620 species; the subfamily relationships are in the midst of reorganization^{1,2,3,4,5}. In particular, the work of Wilson *et al.*³, recommends a new system 17 tribes, wherein the Letospermoideae are divided among nearly a dozen clades. The anticipated summary for Sabah and Sarawak should provide a companion to Henderson's classic summary of *Syzygium* in Malaya⁶.

The family as a whole can be characterized as woody plants, almost always trees and multi-branched shrubs. The bark is famously varied in color, almost always thin, flaking in patches large or small. The twigs are thin, the leaf stalk is short and without well-developed stipules, however, the node sometimes bears varied elaborations and glands. In some, the blade bears pellucid dot glands. The nervation is typically thin, either closely pinnate, or three-nerved, and often with a well-developed intramarginal nerve. The plant body accumulates aluminum and the leaves usually dry variously yellow, bright green or black. The flowers are mostly bisexual, with parts in fours and fives, an imbricate calyx, a flimsy, but sometimes showy corolla, wrinkled and deciduous; the stamens are many, often with an apical gland, typically in a powder puff display. In accordance with the traditional subfamily arrangement as described above, many genera have inferior ovaries and fleshy fruits, while another large group of genera bear superior ovaries that mature as dry capsules.

¹Wilson, P. *et al.* 2001. American Journal of Botany. 88: 2013-2025.

²Wilson, P. *et al.* 2005. Journal Plant Systematics and Evolution. 251: 3-19.

³Sytsma, K. *et al.* 2004. International Journal of Plant Science. 165: 85-105.

⁴Lucas, E. *et al.* 2005. Journal Plant Systematics and Evolution. 251: 35-51.

⁵Biffin, E. *et al.* 2007. Molecular Phylogenetics and Evolution. 43: 124-139.

⁶Henderson, M. 1949. Gardens' Bulletin (Singapore). 12: 1-293.

Leptospermum



Leptospermum. 1 & 2, *L. flavescens*, from Mingan, Philippines; 1, the capsular fruit and spirally arranged leaves; 2, the flower; 3, possibly an undescribed species from Mt. Mantalingahan, Palawan, Philippines; 4, line drawing of flower and fruit. (Photograph 1, © Leonardo L. Co; 2, © Ulysses Ferreras; 3, © Nestor Bartolome; drawing adapted from BAILLON *loc. cit.*)

Melaleuca



Melaleuca cajuputi, although typically a coastal species, it is here found near its westernmost location, in occasionally inundated land in Cambodia about 200 km inland.

Tristaniopsis



Tristaniopsis whiteana. 1-2, leaf, bark and and habit from Sarawak; 3, the flower from Singapore. (Photograph 3, © Joseph Lai.)

The ecological importance of the family in Asia and Australia can hardly be exaggerated in so far as the family includes *Syzygium*, the most species-rich of all genera of trees. In contrast to the ecological importance, the commercial economic value of the Myrtaceae is heterogeneous and based on varied relatively minor products that include oils, spices, local fruits and local timbers.

☞ - *Leptospermum* Group - ☞

These are trees with spirally arranged leaves, dry dehiscent capsular fruit, often with winged seeds. The traditional subfamily is heterogeneous and species-rich, and evidently paraphyletic with regard to the fleshy-fruited Myrtoideae. I list ten genera for our region, each with a similar sort of geographic distribution; the following numbers are typical: about 20 species in Australia, 5 in New Guinea, 5 in the Philippines 2 in Borneo, 1 in Malaya and Sumatra and none in Mainland SE Asia. The student of trees of tropical Asia could see these trees as geologically recent invaders from Australia, few in number and occupying outposts on sandy shores, exposed mountain tops, degraded lands, ultrabasic soils, and along riverbanks and swamps. *Whiteodendron* is the only successful shade-tolerant element in the dry forests of the equatorial lowlands.

LEPTOSPERMUM. [Greek, slender-seed.] A genus of 80 or so species of Australia. In tropical Asia, the names *Leptospermum flavescens* and *L. javanicum* have been widely applied to these small trees that occupy exposed outcroppings (up to 2000 m) or open places at sea level on degraded white sands. They are called *china-maki* in Malay, and *malasulasi* in the Philippines. WONG & PHILLIPS *loc. cit.* offer nice photographs of a stand of *L. recurvatum* on ultrabasic soils high on Kinabalu. BURKILL *loc. cit.* notes that the leaves of lowland species were brewed as an herbal tonic.

MELALEUCA. [Greek, black-white, for the coloration of trunk and branches in one species.] A large and important genus of Australian trees, with over 200 species. A few species are found westward in tropical Asia, but especially *Melaleuca cajuputi*, which occurs along the seacoasts, in low wet sandy forests, and on disturbed low summits. However, it has also been cultivated since ancient times as far west as China for *cajuputi* oil. The western populations have low genetic diversity relative to Australian populations, although it is unclear to what extent this is the result of ancient cultivation, or a natural distribution⁷.

TRISTANIOPSIS. [Formerly *Tristania*, which commemorates J. Tristan, d. 1861, French botanist.] About 80 species found in New Guinea, Australia and New Zealand, with maybe eight species westward to tropical Asia, with six in Malaya, in the Philippines. The Malay

names include *selunsur puteh*, *selan*, and *malaban*. The white bark curls off in strips and accumulates around the base of the tree, leaving what appears to be at first glance a bright red naked trunk. Several species of *Tristaniopsis* are significant elements in swamp forests, especially in Borneo, Sumatra and southern Malaya (*T. obovata* and *T. whiteana*) but also extending into the southern parts of Mainland SE Asia in Thailand and Cambodia (*T. burmanica*). Several species are equally common along coastal forests.

WHITEODENDRON. [Commemorates CT White, noted author on Myrtaceae.] A monotypic genus represented by *Whiteodendron moultonianum*, endemic to Borneo, well-known in Sarawak as *kawi*. The leaves are similar to *Tristaniopsis*, but are asymmetric and the molecular studies cited indicate that the two are unrelated. *Whiteodendron* can be especially numerous on nutrient poor sandstones and in *kerangas*. The Lambir Hills plot included a population of 4100 trees in 52-ha, 142 of which were over 30 cm DBH with a maximum DBH of 71 cm. The species was tightly restricted to only that portion of the plot over sandstone soils, and yet it was oddly patchy within and especially patchy with regard to the abundant recruitment. Growth over 10 years was almost negligible; 91% of the trees showed less than one mm of growth per year. The population ecology and ecophysiology of this tree deserves to be better known because it is one of the few Leptospermoideae that does well as a shade tolerant member of the lowland dry soil forests. The timber is hard and a favorite fire wood.

BAECKEA. [Commemorates Abraham Bäck, Swedish physician and friend of Linnaeus.] About 70 species in Australia, one species, *Baeckea frutescens*, west along coastal strands and open exposed mountain tops. The Malay name is *chuchur atap*. Ecologically and economically comparable to *Leptospermum*.

METROSIDEROS. [Greek, heartwood and iron.] A much studied genus of about 50 species comprising well-known trees of the Pacific Islands, especially of New Zealand, New Caledonia and *M. polymorpha* of Hawaii. The genus is barely represented in our region by the rare *Metrosideros halconensis* of the Philippines, found originally on Mt. Halycon on Mindoro Island, and later at a second site in mossy forest in Mt. Urdeneta, Mindanao. (Not illustrated.)

KANIA. [From A Papua name.] A genus best represented by the first described species, *Kania eugenioides* of New Guinea; a medium-sized tree with opposite leaves and small dehiscent fruits that bear some 10 seeds. For most of the 20th Century, that was the only species, and one wrongly transferred for a while to *Metrosideros*. Recently, an additional five species have been added. These include two species from the Philippines based on isolated type specimens: *Kania microphylla* from Quirino, Luzon and *K. urdanetensis* from that classic locale in

⁷Lum, S. 1994. Dispersal of Australian plants across Wallace's Line: A case study of *Melaleuca cajuputi* (Myrtaceae). Ph. D. dissertation. University of California - Berkeley. 109 pp.

Whiteodendron



Whiteodendron moultonianum, Sarawak, habit and leaf with narrow slightly invaginate base and distinctive venation.

Mindanao, both from high mossy forests over 1500 m. (Not illustrated; digital images of the types are available on the internet.)

EUCALYPTUS. [Greek, well formed calyptera or lid in reference to the sepals and petals united to form a cap.] One of the most important genera of trees in Australia with over 600 species. These are trees of strongly dry seasonal climates and have not penetrated the everwet lands of tropical Asia, and so seem to have been barred from expanding into the monsoonal lands of India. Two species are native within our area. *Eucalyptus deglupta* is a native of Mindanao and scattered in the Visayas as far north as Leyte. Fairly well-known locally by the name *bagnas*, it is a large tree reportedly reaching two m DBH and 60 m in height. The altitudinal range is apparently great, from sea level to 1000 m. Although the natural populations are scarce, it is now grown in plantations. *Eucalyptus urophylla* of the Lesser Sunda Islands is generally called *ampupu* or sometimes by the English name Timor white-gum. It is likewise a locally important timber.

Additionally, another six or so species from Australia and New Guinea are cultivated in plantations for small timber or for chip and pulp. Plantations in Hawaii were once very extensive and included more than 50 introduced species. China claims over 100 cultivated species. Australian scientists are currently in the midst of dividing the genus into several smaller genera, and so the names of the eucalypts may well change in the coming decades. We can also note that *Eucalyptus regnans* is the tallest of all angiosperms, and with a historical record of the tallest of all modern trees.

Baeckea



Baeckea frutescens, a sparse open branched shrub growing on white sand in Cambodia.

XANTHOSTEMON. [Greek, golden stamens of *X. chrysanthus*, although the species are variously colored.] About 45 species of *Xanthostemon* are known, principally Australia and of scattered occurrence east in the Pacific; westward the genus is rich in New Guinea and somewhat less so in the Philippines where we find at five or more species as shrubs, typically in open stunted vegetation over ultrabasic soils. *Xanthostemon chrysanthus* is a popular cultivated species, at least in Australia.

XANTHOMYRTUS. [Greek. golden-flowered myrtle.] A genus of about 24 species in Australia, scattered in the Pacific and few significant species in New Guinea and, at least *Xanthomyrtus diplycosiifolia*, scattered with greater infrequency east and north to the highlands of Borneo, Mindanao and Luzon. The leaves are opposite, the flowers small with yellow petals, the fruit a small blue berry with a very large number of extremely small wingless seeds. (Not illustrated.)

☞ - Syzygium Group - ☞

The old subfamily Myrtoideae, recognized by the opposite leaves and fleshy fruit, is polyphyletic. A new monophyletic group has been identified, centered on the Neotropical fleshy fruited genera, which includes the largely American *Eugenia* and *Myrtus*, but also includes *Rhodamnia*, *Decaspermum*, *Rhodomyrtus*. The group excluded the main Asian fleshy-fruit Myrtaceae which form a more complex grade around *Syzygium*, and may include some of the genera with dry capsular fruit such as *Tristania*. The position of *Osbornia* remains uncertain.



Xanthostemon fruticosus, Philippines, above flowers in bud with exerted style, below with mature stamens. (© Leonardo L. Co).

OSBORNIA. [Commemorates John Walter Osborne, Australian chemist, circa 1860.] A monotypic genus, *Osbornia octodonta*, a small mangrove, with a split distribution, Philippines to Maluku and then from east New Guinea to Australia. Readily known in English as the “myrtle mangrove”, neither morphology nor molecular evidence has yet decisively clarified whether this is a myrtle allied with *Leptospermum* or a type of *jambu* allied with *Syzygium*. The small leaves are opposite, but the fruits are leathery and evidently indehiscent, probably floating in aid of dispersal. This is a not uncommon mangrove, a low multi-branched shrub, scattered in open patches, not gregarious, with spongy black and gray bark.

RHODAMNIA. A genus of about 28 species, chiefly from New Caledonia to New Guinea, with 13 endemic species in Australia, a few species westward as far as China and Myanmar. *Rhodamnia* includes the only Myrtaceae with stellate hairs, these found in Australian species. Our species are trees of the lowland forest, although typically of secondary forests or recruiting in gaps in the primary forest. The best known species is *Rhodamnia cinerea*, which is common in secondary forests of the Sundaic Region, and can be found as far west as Laos. It is known as *mempoyan* in Malay, or silver-back in English, in reference to scaly bright lower leaf surface. The bark of *R. cinerea* is distinctive in the finely furrowed red appearance, which together with the three-nerved opposite

leaves with a silvery lower surface should be adequate to identify this species. (Other genera with opposite three-nerved leaves, such as *Pternandra* and *Strychnos*, do not have a silvery lower surface, or have a clear nodal scar.) Although it is regarded as a species of secondary forests and gaps, it is a slow growing tree. The twigs bear nearly sessile clusters of small white flowers at old leaf scars; the fruit are likewise small, purple and fleshy.

DECASPERMUM. [Greek, ten seed.] A genus of 30 species, from Australia and the Pacific, west to Mainland SE Asia. The Philippines claims five species, two of which are also in Malaya. Reproduction in the variable and widespread shrub of secondary forests, *D. parviflorum*, was studied in Sulawesi. It proved to be cryptically dioecious; staminate plants provide fertile pollen as a reward to bees and bloom 20 minutes before the functionally pistillate plants which provide only sterile pollen⁸. Comparative observations from elsewhere in Asia would be of interest.

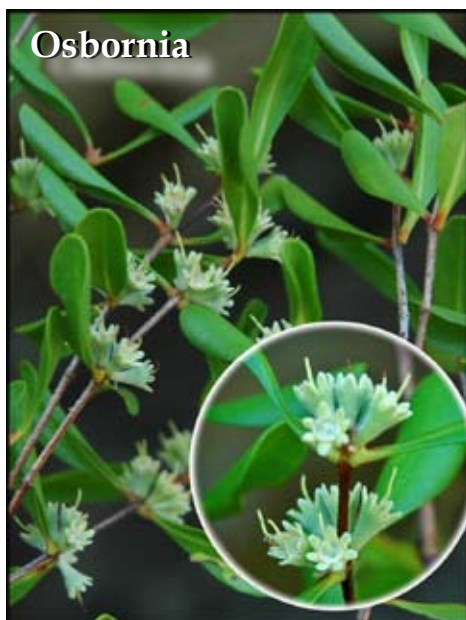
RHODOMYRTUS. [Greek, rose-colored myrtle.] 11 species with seven endemic to Australia, and one, *Rhodomyrtus tomentosa*, widely from Australia westward as far as China. This is a distinctive shrub of white sands and along the seashore; common on east coast of Malaya, sometimes in exposed summits. The leaves are three-nerved and white woolly below. The large purple flowers are pollinated by various bees. The individual flowers last for two to three days, but the stigma is receptive only on the morning of day that they bloom⁹.

PSIDIUM. [Derived from the ancient Greek for the pomegranate, *Punica granatum* (Lythraceae).] A Neotropical genus of which the cultivated guava, *Psidium guajava*, has become a naturalized part of the tropical Asian flora. Besides a frequent cultivated species, it is prevalent in degraded open landscapes in much of the Philippines, in most Pacific Islands, and in parts of the Malay Peninsula, and it remains a potentially destructive invasive species in many areas. Guava is well known in Malay as *jambu batu*, for the small hard seeds, so different from the soft seeds of the native *Syzygium*. In the Philippines it is called *bayabas* or, at least in cultivated form, by *guayaba* or *guapple*. The softer fruit are rarely seen in Asia, the preferred type, or to least the most common, is collected green, the flesh white, and eaten in the manner of green mango. The leaves, rich in tannins, are widely used herbal remedies and also as a source of a black dye.

SYZYGIUM. [Greek for united, in probable reference to the united petals in some species.] A monophyletic genus when taken in the broadest sense to incorporate the segregate genera *Acmena*, *Acmenosperma*, *Cleistocalyx*,

⁸Kevan, P. et al. 1985. Biological Journal of the Linnean Society. 25: 319-330.

⁹Craven, L., et al. 2006. Blumea. 51: 131-142.



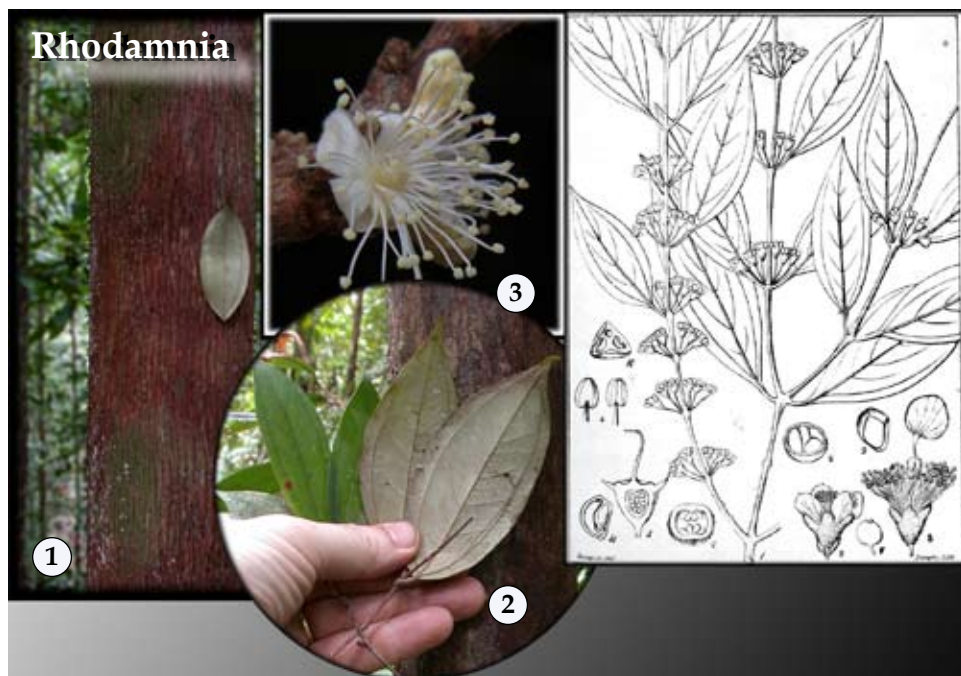
Osbornia octodonta, the mangrove myrtle, here in flower from Hundred Islands National Park, Philippines (© Leonardo L. Co).

Piliocalyx, *Waterhousea* and *Pseudeugenia*¹⁰. *Syzygium* is the most species-rich of all genera of trees in Asia. The total is certainly over 1000 species with nearly that number found in the region covered in this volume, although with sufficient uncertainty in species identity and distribution there is little point in estimating the number too precisely. We can list 160 in Malaya, over 200 in Borneo and over 200 in the Philippines, and 100 in Mainland SE Asia. Within each region many species, perhaps the majority, are endemic. Most regions within tropical Asia have a fairly recent review of the species while Parnell, Craven and Biffen have reviewed the phylogenetic systematics of the genus as a whole¹¹.

The genus is uniform in vegetative features in so far as all species bear opposite shiny more or less resinous leaves without a nodal scar, the nerves and veins are mostly of a similar thickness set at nearly right angles to the midrib and looped within the margin. Beyond that, there is a great deal of species-specific variation in stature. Although *Syzygium* can reach large diameter - over one m, they are not tall trees. On the other hand, they are rarely small trees: of the 55 species in the Lambir Plot, only one, *S. rosulentum*, was both abundant (more than 100 individuals) and consistently small with no

¹⁰Wei, M., *et al.* 2009. Nordic Journal of Botany. 27: 154 - 160.

¹¹Parnell, J., *et al.* 2006. In *Reconstructing the Tree of Life: Taxonomy and systematics of species-rich taxa*. CRC Publications.



Rhodamnia cinerea, in the Malay Peninsula; 1, the cylindrical bole and red narrowly furrowed bark with a fallen leaf, 16 cm DBH; 2, the opposite 3-nerved leaves with silvery lower surface; 3, the short-stalked flower, about 7 mm across, borne at old leaf scars.



Psidium guajava, the Neotropical fruit tree, cultivated in the Philippines, adapted from BLANCO *loc. cit.*



Rhodomyrtus tomentosa, on seasonally inundated white sands, Cambodia; note 3-nerved leaves, flower, buds and calyx lobes.



Decaspermum blancoi, Philippines, opposite leaves, flower and flower bud.

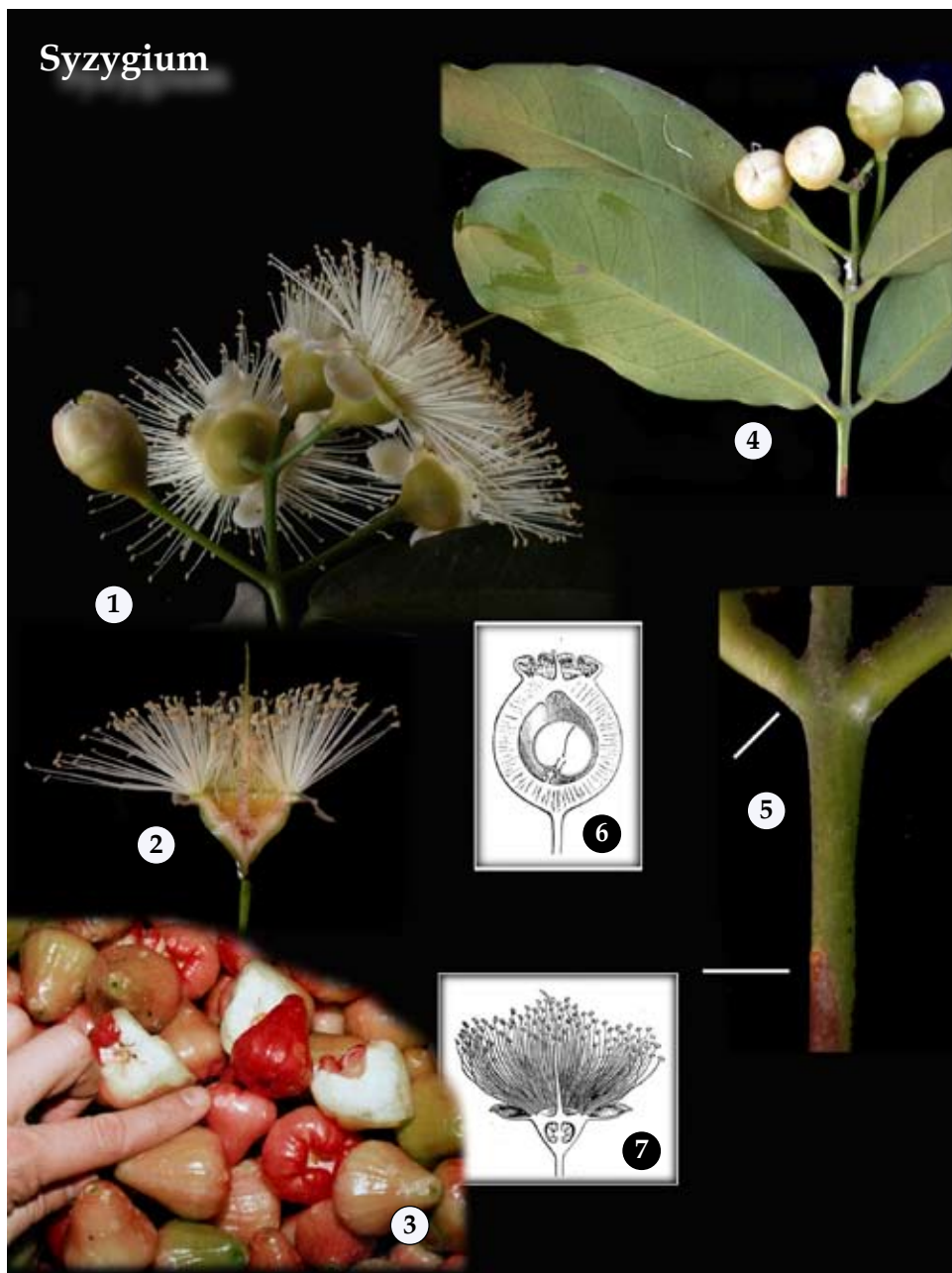
tree over 30 cm DBH. At Pasoh we found 46 species, of which four had both more than 100 individuals and a maximum DBH less than 30, while only *S. scortechini* was a genuinely small tree.

Bark color varies from white to various shades of red; flaky papery bark is common, but other forms occur. The leaf blade varies in all details of shape, thickness, density of venation, surface texture, both fresh and dry, and even odor. The bark of the twigs is especially useful in herbarium specimens; it varies among green, white, red and black. However, note that the color of the twig bark changes with maturity along the length of the twig. One significant source of confusion in sorting out specimens is that the sprouts from the base of the larger trees usually bear leaves that sharply differ from those in the canopy.

There seems little point mentioning the more common forest species. The genus would merit a volume in itself. The illustrations portray some of the variation to be found. Identification will require a good description of the plant and fertile material that preferably include fruit close to maturity. I might, however, add a note on the names of the cultivated fruits because they have had a particularly troubled history and are commonly mixed in popular literature.

A few species are cultivated for the flowers and foliage; these include *S. polyanthum*, which is *daun salam* in Indonesian cooking. A smaller tree native to Mainland SE Asia and now widely grown for the red flush of new foliage is *S. campanulatum*. A popular shade tree, especially common in Singapore, is *S. grande*, which is also an ecologically important tree of coastal forests in Ma-

Syzygium



Syzygium. 1-5, *S. samarangense*, cultivated in the Philippines. 1-2, form of inflorescence and flower, typical of the genus; 3, the mature fruit with fleshy white portion below the flower, the cultivated forms often without seeds; 4, the paired opposite leaves with thin nerves looped within the margin of the blade; 5, the clean node without scars or scales, the bark becomes flaky red with age; 6-7, drawings of the flower and fruit of *S. jambos*, from BAILLON *loc. cit.*



Syzygium diversity. These illustrations give only a sampling of the rich diversity of form found among the hundreds of species in the genus. The genus is characterized by trees of relatively large diameter (Photo 5, 87 cm DBH) and thin red flaky bark (especially 4, 5, 6, & 7). White bark is not uncommon (1 & 9). The bark form can be tight and fine textured like sand (10) or with large flakes (6), or thicker with shallow furrows (8). The bole itself can be well formed and cylindrical (10), or deeply fluted (5), or with plank buttresses (2 & 7). Cauliflory is unusual and dramatic (3). The leaf nervation can be robust with pronounced raised looping nerves (12, 13, 14) or very

often with fine, nearly obscure parallel nerves (4). Photographs: 1, *Syzygium* sp. Number 10, Pasoh; 2, *S. koordersianum*, 60 cm DBH, Pasoh; 3, *S. curranii*, Palanan, Isabela, Philippines; 4, *S. syzygioides*, Pasoh; 5, *S. prasiniflorum*, 87 cm diameter above the buttresses, Lambir; 6, *S. politum*, 13 cm DBH, Pasoh; 7, *S. fusiculiferum*, Lambir; 8, *S. myrtifolium*, 28 cm DBH, Lambir; 9, *S. megaphyllum*, Lambir; 10, *S. chloranthum*, Pasoh; 11, *S. ciliato-setosum*, Palanan, Isabela, Philippines; 12, *S. formosum*, Lambir; 13, *S. duthieanum*, Pasoh; 14, *S. ochmeocarpum*, Lambir. (Photographs 3 & 11 © Leonardo L. Co.)

laya. Among the spices, *Syzygium aromaticum*, the clove, is renowned for the fragrant dry flower buds. The production and consumption are centered in Java, chiefly for *kretek* cigarettes.

The fruit trees include *Syzygium cumini*, a large tree with small dark purple fruit; known as *jiwat* or *salam* in Java, *lumboy* or *dubat* in Philippines. It is cultivated and somewhat naturalized widely in tropical Asia.

The rose-apples are of three main kinds; however, the common names are a terrible muddle and the botanical names are likewise insecure. *Syzygium malaccense* is widely grown in Malaya and Mainland SE Asia. It is distinguished by red flowers borne on the branches; the fruit is barrel-shaped and striped red, purple and white with longitudinal ridges. The leaves lack fragrance. Although this kind of tree is clear, the specific epithet *malaccense*

has been formally published four times while the common names Malay rose-apple or Malaka rose-apple are likewise applied variously.

Syzygium jambos is a clear type, at least in the uniform sort that is invasive among the Pacific Islands, Florida and the Caribbean. It is distinguished by the narrow leaves, white delicate flowers and usually greenish to yellow fruit, sometimes flushed with red at maturity.

The most common market fruits include *Syzygium aqueum* and *Syzygium samarangense* (the latter is taken to be synonymous with *S. javanicum*.) The trees vary in the size of the flowers, especially the style length, the width of the hypanthium, the length of the fruit stalk and shape of the leaves. Different authors hold different opinions on whether the differences conform to species. Molecular evidence would help sort matters out.



MELASTOMA ALLIANCE

As a pair, the two families Memecylaceae and the Melastomataceae form a strongly monophyletic group that shares a great many features of floral and vegetative form and ecology. However, once we decide to divide the group as two families, and subordinate the pair within the Myrtales, we are left without a good name for the combination.

While the general arrangement presented here has strong support^{1,2,3}, sampling among the many genera of the higher melastomes remains sparse, and so new and complete arrangement of clades within the family is not yet possible. For now, the following points are clear.

Memecylaceae are distinguished most obviously by the leaves with pinnate venation and the leaf surface drying with a more or less roughened surface and obscure venation. Memecylaceae, followed by *Pternandra*, are evidently basal to the rest of the melastomes and distinguished from them by the anther which bears a fibrous anther endothecium. Within the melastomes themselves, many of the critical character states are non-homologous. For example, berries evolved from capsules at least four times. The first major clade consists of *Astronia* relatives, geographically centered in New Guinea and distinguished by anthers that open by slits; all higher melastomes have poricidal anthers. The next major clade combines a rich diversity of genera and species related to *Miconia*, trees and shrubs that are abundant and critically important in the Americas but not represented at

all in Asia, except for the invasive weed, *Clidemia hirta*. To explore the range of form found among these sorts of Melastomataceae, you might go through the photographic collection at Robin Foster's web site⁴. The next clade is formed of the combined tribes Dissochaeteae and Sonerileae, the latter nested within the former and the latter to include Oxysporeae. This clade is centered in the western parts of tropical Asia, and is sparsely represented east of Borneo. It includes most of our more obvious herbs, especially *Sonerila* and *Phyllagathis*, and a group of closely related genera related to *Blastus*. Species of the tribe Melastomeae are distinguished by basally elongated anther connectives, hairs on the ovary and in seeds curled like a snail-shell; it includes the obvious *Melastoma malabathricum* of roadsides and forest gaps.

The two putative basal groups, *Memecylon* and *Pternandra*, are the principle representatives of the combined families within the lowland equatorial forests of Asia, whereas the advanced clades of the melastomes are uncommon as trees and shrubs. Indeed, in contrast to the American tropics where the shrubby melastomes are an ecologically critical component of the lowland forest understory, forest inventories of Asian lowlands often show not a single species.

In certain wet mountains you might find growing in sympatry species of *Memecylon*, *Astronia*, *Medinilla* and *Melastoma*. While these trees are all related to one another, bear in mind that these represent very different clades with very different geologic histories of origin, spread and diversification. They came to live in concert in the Asian mountains by a very long and complex road.

Susanne S. Renner has published widely on the Melastomataceae and Memecylaceae. Many of her publications are available at her web site⁵. Also, the current accepted names of melastomes, together with a complete bibliography, are being assembled at a very efficient web-site⁶.

¹Renner, S. 2004. Philosophical Transactions of the Royal Society of London. B. 359: 485–1494.

²Clausing, G., et al. 2001. American Journal of Botany. 88: 486–498.

³Stone, R. 2006. Systematic Botany. 31: 107–121.

⁴Neotropical Plant Guides. (<http://fm2.fieldmuseum.org/>)

⁵Susan Renner Home Page. (<http://www.colorado.edu/>)

⁶Melastomataceae. (<http://www.melastomataceae.net/>)

Phylogeny of the *Melastoma* Alliance: Genera in Tropical Asia

	Genus	Diversity & Distribution	Trees of Tropical Asia
	<i>Lijndenia</i>	15?, Africa, 1 east to Asia.	1, widespread.
	<i>Memecylon</i>	300, Africa to the Pacific.	100, abundant.
	<i>Pternandra</i>	15, Asian tropics.	12, abundant.
	<i>Astronia</i>	59, New Guinea and Philippines.	
	<i>Beccarianthus</i>	22, New Guinea, Philippines, Borneo.	
	<i>Astrocalyx</i>	1, Philippines.	1, Philippines.
	<i>Astronidium</i>	67, chiefly New Guinea to the Pacific.	0?.
	<i>Miconia</i> Group	More than 60 genera, and 2500 species. herbs, shrubs and trees; Neotropical.	0, <i>Clidemia hirta</i> naturalized.
	<i>Blastus</i>	20, India to tropical Asia.	3.
	<i>Oxyspora</i>	30? = <i>Allomporphia</i> ? India to Pacific	2.
	<i>Anerincleistus</i>	15, tropical Asia.	15.
	<i>Ochthocharis</i>	7, Africa, Asia.	5.
	<i>Medinilla</i>	400, Africa, Asia.	250, especially epiphytic.
	<i>Melastoma</i>	22	15, shrubs.
	<i>Osbeckia</i>	20	herbs and 1-2 shrubs.



BASAL ROSIDS: MYRTALES

MEMECYLACEAE

NAME: From the genus *Memecylon*, as below. An alternative family name is Memecylonaceae. Note that if this clade is recognized as a subfamily of the Melastomataceae, the earliest name is not Memecyloideae, but is rather Olinbeoideae.

OVERVIEW: Based on the molecular phylogenies cited, the Memecylaceae are a strongly monophyletic group basal to the melastomes, from which they differ most obviously in the mostly pinnate leaf nervation, and in anthers that open by longitudinal slits, although sometimes shortened and nearly poricidal. The family comprises about 300 species of *Memecylon* in Asia, the genus *Lijndenia* in Africa, Madagascar and Asia, two other African genera, and 75 species of *Mouriri* and six of *Votomita* in the Americas, mostly in the Amazon Basin.

LIJNDENIA. Several abundant species in Africa and one species, *Lijndenia laurina*, widespread and common in lowland forests across the Sundaic Region, Java and the Philippines. Formerly this small tree was widely known as *Memecylon oligoneurum* but differs from other *Memecylon* most conspicuously in the three-nerved leaf

blade. The genus is thought to be androdioecious. When sterile, it is easily mistaken for *Pternandra coeruleum*, and possibly also with *Strychnos* (Loganiaceae). You simply have to compare the details of venation carefully. *Rhodamnia* (Myrtaceae) is similar but lacks the scar across



Lijndenia laurina, from Lambir, Sarawak, the blade with three strong nerves and so differs from *Memecylon*.

¹Stone, R. 2006. Adansonia. 28 : 337-358.

Memecylon



Memecylon. 1, species of larger stature have a characteristic brown bark with narrow and sharp furrows; 2, most are small single-stemmed trees (inset), the leaves are opposite, short-stalked, elliptic or ovate, mostly with widely spaced pinnate nerves either visible or obscure, the fruit typically axillary, in this species orange; 3, the leaves along the twig are all the same size, shiny, glabrous, with entire margins; 4, the node has a characteristic scar between the leaves, the twig bark is typically red, striate and flaky; 5-7, the flowers are small (usually less than 5 mm) compared to melastomes, with short fleshy corolla parts, white or violet, the stamens blue or violet, usually obvious in aggregate, from axillary clusters; 8, the fruit is from an inferior ovary, calyx remnants persistent, sometimes blue-black as in melastomes.

the node; and *Lijndenia* differs from *Cinnamomum* by the odor.

MEMECYLON. [From a classical name for the unrelated genus *Arbutus* with similar looking purple fruit.] A typical total is given as 300 species for the more than 600 published basionyms cited by *Index Kewensis*. Madagascar claims 80 species that represent a recently diversified and endemic clade following a single colonization event¹. In tropical Asia, we may find a total of 100 species, although endemism is high for each floristic region and the totals have not been collated: 11 in China, 29 in Malaya, about 40 in Borneo, 38 in the Philippines, one in Australia. *Memecylon* are locally abundant and species-rich: among the large-scale plots we found at Pasoh 12 species, Lambir 12, Huai Kha Khaeng two, and at Palanan four. Individual species differ in most details of vegetative form, especially in the bark, twig form, leaf shape and extent to which the nerves are visible. Such differences are consistent among a particular forest population and so it is not hard to learn the local species. However, finding a species name is exceedingly difficult. For example, the meticulous flora of Mt. Kinabalu records 15 species of *Memecylon* of which only eight could be confidently named. The only advice is to match specimens against well-annotated specimens at a regional herbarium.

Almost all species of *Memecylon* are trees with a single main trunk. The bark of *Memecylon* is almost always thin (hence the Malay common name for the entire genus, *nipis kulit*). Many of the species of larger stature have a characteristic bark of very sharp, narrow and thin fur-

rows. However, the many species of smaller stature are varied and may be papery white or smooth dark red-black.

Memecylon have opposite, entire leaves. The blade dries bright green (a few red or black); the venation is pinnate. Often, the nervation is completely obscure in fresh and also dry leaves. The blade can be minutely punctate when held up to the light. The blade typically bears numerous fine crystals that render the surface pimply when dry. The node is swollen, but perhaps only noticeably so in those species in which the leaf stalk is larger than the twig. It is usually glabrous, smooth and shiny; in *M. paniculatum* it is strongly four-winged. The node is without stipules, but is notably different from other Myrtales. In *Memecylon* the node always bears a clear and obvious intra-petiole scar that may be accompanied by various small scales, or awns or glands. This feature is useful in distinguishing *Memecylon* from some *Syzygium*.

The leaf and twig break are without exudate, which quickly distinguishes *Memecylon* from those trees with opposite pinnate-nerved leaves and white exudate such as *Garcinia* and Apocynaceae.

The inflorescence is typically dense and axillary; *Memecylon* is without the great terminal panicles of flowers found in so many melastomes. The small flowers are bisexual, often blue and have inferior ovaries, but the parts are otherwise free, the calyx is valvate and there are twice as many stamens as petals; the anthers dehisce by slits; glands on the connectives produce terpenoid-containing compounds that are collected by tiny bees, usually Apidae and Anthophoridae and thus aid buzz pollination. A few species bear white flowers and lack glands. Dispersal



Typical leaf form in those species of *Memecylon* with obscure leaf venation. On the left is *M. lilacinum* at Pasoh, note the pale thinly flaky bark; on the right, a voucher specimen of *M. borneensis* from Brunei. (Photograph on the right adapted from voucher photo © Professor Eizi Suzuki.)

of the blue or white berries is by understory birds, probably by gut-passage. *Memecylon* flower and fruit more regularly than many trees of the equatorial forest, and so provide a significant food supply to wildlife as a source of fruit.

Populations of *Memecylon* are widely scattered within the forest as would be expected in bird-dispersed species. The different sympatric species appear to segregate chiefly by soil moisture. Growth is exceedingly slow. Over 20 years monitoring at Pasoh forest, the great majority of thousands of *Memecylon* trees grew no more than one mm DBH per year. Not surprisingly, the wood is very dense and hard. Other than a minor use of timber, these trees seem to have a negligible use in the human economy.

ROSIDS: MYRTALES

MELASTOMATACEAE

NAME: From the genus *Melastoma*, as below. There are no local common names for the family as a whole.

OVERVIEW: Melastomataceae, excluding Memecylaceae, comprise some 3000 species in the Neotropics, and 240 in Africa with another 230 in Madagascar. The common claim of "1000 species of melastomes in Asia" would appear to be contradicted by the treatment in this volume which lists 11 genera and no more than 150 species of trees and shrubs. Of course, we would augment that number by including *Memecylon*, the herbs and climbers, and by including India, New Guinea and China. And yet the total would still seem to be less than 500 species. The melastome flora of Thailand is 15 genera and 70 species; that of the Philippines, 14 genera and 130 species. In both cases, half or more of the species are herbs, epiphytes, and weak-stemmed climbers.

These comprise a fairly uniform and easily recognized family. Melastomataceae are recognizable by their opposite, entire, exstipulate leaves with three or more strong ascending veins; tertiary veins are conspicuous and run at right angles to the midrib. The flowers are often colorful and conspicuous, their petals purple to pink and contorted. The anthers open by slit in *Pternandra* and the *Astronia* Group, and by pores in all of the more advanced melastomes; they invert during development and are further distinguished by the typically elaborate connective. The most commonly met species is the nearly ubiquitous *Melastoma malabathricum*, which is a good basic example of the family, although bear in mind that there is much diversity in floral and vegetative detail. For example, the common herbs of *Sonerila* are sometimes distinguished by leaf blades that are strongly unequal as a pair, by the lack the typical venation and by toothed leaf margins.

Compared to the extensive knowledge of Neotropical melastomes, the Asian representatives are poorly known, chiefly because they are found sparsely and to a large extent in isolated wet mountains. Also, the small fragile flowers make relatively poor specimens. The last regional account of the family was based largely on herbarium specimens and is very much out of date¹. Many individual genera have been revised to species and a few national accounts are available. However, note that a key to Thai melastomes is completely ineffective in identifying the melastomes of Borneo or the Philippines. A good regional key to genera is not readily available and much needed.

Considering the number of species, the family has a surprisingly negligible role in the economic affairs of Man. It is hard to name a single significant product

whether timber, fiber, gums and resins, poisons, edible fruits or traditional medicines. Chemical surveys have found a few bioactive constituents in *Melastoma malabathricum*. However, the most significant future role for melastomes may be in cultivation, either as an early part of reforestation, where the fruit can attract birds, or as ornamentals. *Medinilla*, *Sonerila* and *Phyllagathis* all have great potential. In one other area melastomes have a significant economic impact and this is in the role of invasive species. At least two exotic melastomes have become very troublesome forest weeds in Asia. *Miconia calvescens* was introduced to Hawaii and Tahiti in the 1930s and is now considered to be one of the greatest threats to the fragile ecosystems of the islands. It is not especially common within the ASEAN region. *Clidemia hirta* on the other hand is already patchily abundant in lowland forests all about tropical Asia. Both species are fast growing, shade tolerant, devoid of natural pests, and the set an abundance of seed with a high rate of germination.

☞ - *Pternandra* - ☞

PTERNANDRA. [Greek, heel and stamen, in reference to the spur.] *Pternandra* is described by more than 40 basionyms that represent about 15 species; it is usually now expanded to include *Kibessia*. *Pternandra* shares with *Memecylon* the habit of a single-stemmed hardwood tree, and also the peculiar anther anatomy described above. These trees differ from *Memecylon* in that they bear the more ordinary melastome type of leaf venation. The position basal to the remaining melastomes is recommended by molecular data and seems sensible. These are trees of the lowland equatorial forest, chiefly in the Sundaic Region, but *P. caerulea* is widely found from Mainland SE Asia to Australia, with a few other species in Celebes and New Guinea, but curiously the genus is still unrecorded for the Philippines.

The common Malay name is *sial-menahun* "bad luck for year" or *sial-menuang* "bad luck to shelter below", the origin of which is unclear. In Sarawak they are widely known as *puloh*.

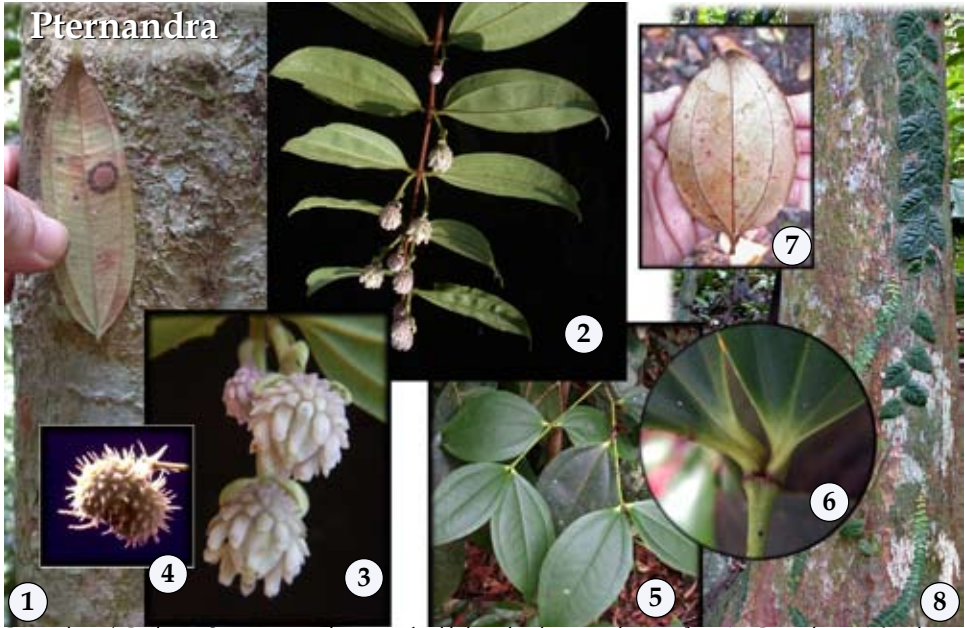
Most of the species are of relatively local distribution, although they might be fairly abundant in any particular forest. They are all superficially similar in leaf form, poorly known in flower, and consequently, despite a good revision of herbarium material², the species level descriptions are still tentative about many details, especially with regard to bark and other field characters. In much of our region, the most common species are probably *Pternandra echinata* with narrow thin blades, and the large-leaf tree, *P. caerulea*, which is commonly spelled with a 'oe' instead of the preferred 'ae'. Most species of *Pternandra* have a few flowers in the leaf axil or at the twig apex; however, *P. multiflora*, and other species formerly in *Kibessia*, differ in the large open axillary panicles.

☞ - *Astronia* Group - ☞

Shrubs and small trees with large terminal inflorescences of small flowers, distinguished by anthers that are short and open by slits rather than

¹Bakhuizen van den Brink, R. 1943. Mededeelingen van het Botanisch Museum en Herbarium van de Rijks Universiteit Utrecht. 91: 1-391.

²Maxwell, J. 1981. The Gardens' Bulletin (Singapore). 34: 1-90.



Pternandra. 1-4, *P. echinata*, Singapore, note the narrow thin blade, scaly calyx cup and mature fruit; 5-8, *P. caerulea*; 5-6, sapling in Malaya with large broad leaf and characteristic node; 7-8, mature tree with fallen leaf in Singapore.

the pores typical of higher melastomes; by ovules parietal or nearly basal, the floral parts in fives, 8 stamens and the fruit a dry capsule. The clade is too often wrongly described as Bornean. It is chiefly found in New Guinea with some in the Philippines and a few to the east in the Pacific (not in

Australia). Additional to the three here, note the genus *Astronidium* with about 67 species, 50 in New Guinea, not in Philippines, some east to the Pacific, Fiji, etc.³

ASTRONIA. [Greek, a star, perhaps in reference to the calyx atop the fruit.] Distributed from China to the Pacific including Taiwan, but exceedingly poor in the west, two in Malaya, only three on Kinabalu; one in Brunei at 1500 m. *Astronia* is especially rich in New Guinea (30) secondarily in the Philippines, where 17 species are found chiefly in the mountains, especially in mossy forests, a few widespread, but many are known only from the type, often from ultrabasics.

ASTROCALYX. [Greek, star-shaped calyx.] Monotypic, *A. calycina*, only in the Philippines, uncommon, and restricted to mid-montane forests along the wet eastern coasts from Mindanao to Luzon. (Not illustrated.)

BECCARIANTHUS. [Commemorates O. Beccari, Italian naturalist of tropical Asia.] More than 20 if defined broadly, 10 in New Guinea, a few in Borneo, four in the Philippines. Uncommon, never abundant, and ecologically distinct in that they prefer lowland forests to the upper mountains.

☞ - *Blastus-Oxyspora* Group - ☞

A Paleotropical clade, represented in tropical Asia by weak-stemmed climbers (*Disochaeta*), numerous herbs of the forest floor (*Sonerila* and *Phyllagathis*) and trees and shrubs surrounding the genera



Pternandra hirta, 4 cm DBH, Lambir, Sarawak, with pale bark, single fruit at twig tip.

Blastus and *Oxyspora*. In contrast to the distribution of *Astronia*, this clade is chiefly found in the west; it surprisingly poor east of Borneo, with no herbs in New Guinea, and in the Philippines the clade represented by only 2 *Sonerila*, 1 *Anerincleistus* in Palawan, the mangrove *Ochthocharis javanicus* in Mindoro, and 2 *Dissochaeta*. Dissochaeteae bear fleshy fruits with seeds embedded in fleshy placentas. Sonerileae (including the *Oxyspora* group) bear capsular fruits, straight or wedge-shaped seeds, and glabrous ovary apices that are either rounded or concave with outgrowths that are especially conspicuous in mature fruit. The Sonerileae are nested within Dissochaeteae.

BLASTUS. [Greek, germinal bud, in reference to the anthers.] 12–20 species from E India to China (nine species, seven endemic), maybe five-eight in mountains of Mainland SE Asia; only the widespread *Blastus borneensis* in Malaya, also the sole species on Kinabalu. As a genus, *Blastus* is distinguished by flowers with only four stamens and a typically lepidote calyx tube and filaments.

OCHTHOCHARIS. [Greek, “beauty of the hills”]. A small genus of shrubs 2–3 m tall, symmetric leaf blade but unequal pair, calyx truncate; “doubtfully different from *Blastus*”. Two species in Africa, perhaps only one in Thailand, five in Malaya, including *Ochthocharis javanica*, a shrub found widely in tropical Asia near mangroves, from Mainland SE Asia to Java, Borneo and Mindoro in the Philippines.

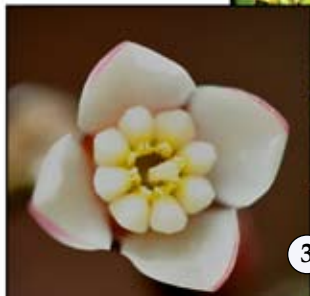
³Maxwell, J, *et al.* 1990. *Blumea* 35: 71–114; 115–165.



Beccarianthus pulcherrimus, Negros, Philippines; © Leonardo L. Co.

OXYSPORA. [Greek, sharp seed.] More than 25 species, found from India and China with less frequency eastward, one on Kinabalu, not in the Philippines, *Oxyspora paniculata* is fairly common from northern India to the hills of Thailand and Vietnam. It bears a

Astronia



Astronia. 1, *A. macrophylla*; 2, fruit of *A. candolleana*, Philippines; 3, flower of *A. cf. quadrangularis*, Migan Philippines. (Illustration 1 adapted from *Atlas der Baumarten von Java*, 1913, figure 303; photographs 2–3, © Leonardo L. Co.)

large open panicle of medium-sized four-petaled flowers. There are eight stamens, the anthers unequal, the calyx is smooth and shiny rather than scaly, the blades are equal.

ANERINCLEISTUS. [Greek, in reference to the presumed indehiscent dry fruit.] Two species in Thailand, 11 in Malaya, eight endemic, three on Kinabalu, one in Palawan, Philippines. Some of the species are strongly anisophyllous, such as *A. setulosa* of Borneo. In general, the flowers with eight stamens, calyx tube not lepidote, blades often unequal, individual blades asymmetric. However, the species are not well known and generic limits are uncertain.

MEDINILLA. [Commemorates Don Jose de Medinilla y Pineta, Spanish Governor of the Marianne Islands.] *Medinilla* is the most species-rich of Asian Melastomataceae; most species are epiphytic shrubs or weak climbers with large paniculate inflorescences. They are rarely found as free-standing shrubs. The Melastomataceae web site cited above lists 302 published names for *Medinilla*, these reduced to 180 accepted species. Regalado suggests that the total might reach 400 species

¹Regalado, J. 1995. Blumea. 40:113-193.

because many species are still poorly known and highly local in distribution⁴. Most species are found between Borneo and the Philippines, with a few elsewhere in the Paleotropics: five in Thailand, one in Australia, two in Africa, and in Madagascar a pocket of endemism with 70 species. Most *Medinilla* have flowers with eight to 12 stamens; a group of nine species bear 16-40 stamens and are sometimes segregated as *Plethiandra*. The genus is exceedingly heterogeneous in details of floral form.

☞ - *Melastoma* Group - ☞

The two genera in the group share a snail-shaped seed. In *Melastoma*, the fruit is a fleshy capsule bursting irregularly, most species with unequal stamens and a prolonged connective. In *Osbeckia* the fruit is a dry capsule, most species with stamens of equal size, without prolonged connectives.

MELASTOMA. [Greek, black-mouth, in reference to the coloring of the fruit.] A genus of 22 species (including *Ouanthera*), from China (five species, one endemic) to N Australia and the Pacific; eight in Malaya, five on Kinabalu, eight to 10 in the Philippines. A few species are specialists in wet forest gaps, and a few have large white flowers. However, most are plants of forest



This distinctive melastome from 1200 m elevation in central Vietnam, is tentatively identified as *Anerinacleistus roseus* Guillaumin, which has in the last decades been transferred to *Pseudodissochaeta roseus* (Guill.) J.F. Maxwell and then later to *Sporoxeia rosea* (Guill.) C. Hansen, demonstrating the difficulty of recognizing clear genera in this complex group.



Blastus. These two examples are from the Central Highlands of Vietnam, but are not named to species. 1, a typical habitat of mossy forest at 1800 m elevation, dark and cloaked in clouds, the canopy about 15 m tall, the trees exceedingly dense; 2, one of the more common trees in the mossy forest, about 6 cm DBH, note the unequal leaf pair; 3-5, in the forest understory of pine forest, note that not all *Blastus* have terminal spikes of flowers.



Medinilla. All photographs from the Philippines. 1, a planting of cultivated species, *M. cumingii* and *M. magnifica*; 2-3, floral details of *M. cumingii*; 4, *M. coronata*, terrestrial shrub; 5-6, an epiphytic shrub, *M. dolichophylla*, with 5 white petals, long narrow leaves; (Photograph 4-6, © Leonardo L. Co.)



Melastoma malabathricum, is a good example of this clade of melastomes. Note the well developed anther connective, the dehiscent capsular fruit with the small snail-shell seeds embedded in the flesh. (Photograph of the flower © Ulysses Ferreras; drawings of flower, fruit and seed adapted from BAILLON *loc. cit.*)

margins and roadsides with purple flowers. The most abundant and obvious species is *Melastoma malabathricum*, found everywhere in the full sun on the good soils and also on the most degraded of white sands. A

team in Japan has recently begun to uncover the intricate means by which root mucilage aids aluminum accumulation which in turn allows the sequestration of otherwise lethal levels of iron^{5,6}. This shrub deserves to be better known with respect to its ecophysiology in general and the nutrient ecology in particular, because it builds luxurious green leaves, flowers and fruits abundantly while living in places that almost no other plant can tolerate.

⁵Watanabe, T., *et al.* 2006. Plant, Cell and Environment. 29: 2124-2132.

⁶Watanabe, T., *et al.* 2008. New Phytologist. 178: 581-589.

OSBECKIA. [Commemorates P. Osbeck, d. 1805, Swedish naturalist, student of Linnaeus.] A widespread Paletropical genus of about 35 species, maybe 10 in our area, mostly Mainland SE Asia, but scattered, three in Malaya, while in the Philippines we find only the widespread small herb *Osbeckia chinensis*, common in open grasslands. *Osbeckia* is distinguished from *Melastoma* as described above.



Osbeckia. Here represented by the Indian species, *O. aspera*. (Drawing adapted from Wight's *Icones Plantarum Indiae Orientalis*, Volume 3, the plate labeled *O. wightiana*, synonymy following current use.)

CRYPTERONIACEAE

NAMES: From the genus *Crypteronia*, as below.

OVERVIEW: The Crypteroniaceae are a small family of about 15 species of trees in three genera exclusive to tropical Asia from India and Sri Lanka east to the Philippines and New Guinea. These odd and somewhat singular plants bear simple, entire opposite short-stalked leaves, and small dry capsular fruit with tiny winged seeds.

Although a small and unfamiliar family, it has received considerable attention from phylogeneticists.^{1,2} Their results are significant because, in concert with estimates of the time of divergence, they provide one of the better example of the 'out-of-India' scenario, whereby taxa that originated in West Gondwanaland in the mid Cretaceous arrived in tropical Asia via continental rafting on the Indian plate.

The reproductive ecology is poorly known. The description of flower sexuality and breeding systems in the three genera is little more than a guess. The winged

seeds that characterize the family are unlikely effective as agents of air-dispersal, but perhaps function in water transport. The species-level taxonomy is poorly resolved.

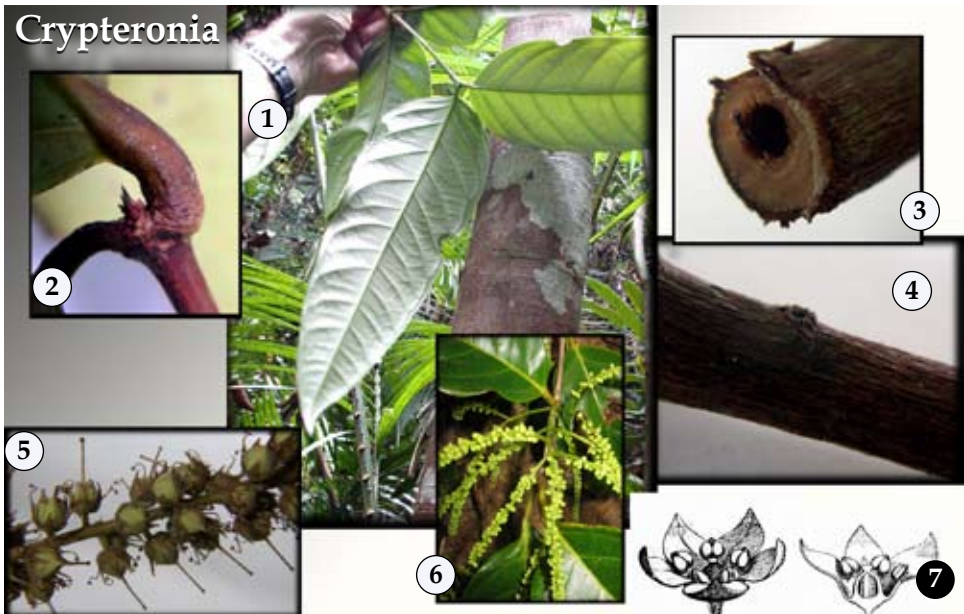
CRYPTERONIA. [Greek, hidden-love, in reference to the small flowers.] The genus of perhaps eight species is found throughout tropical Asia, from Sri Lanka eastward to New Guinea, with two or three species in each of the main regions. *Crypteronia* is surprisingly well known to people in the region despite the fact that it seems to have no use whatsoever. In Malaya, these trees are called *bekoi*, in Borneo by the appropriate name *ubah semut* for the *Syzygium*-like leaves and the twigs with ants, and in the Philippines as *tiaui*.

These are usually encountered as small and medium-sized trees, although outsized *Crypteronia* are sometimes found. The plant body is without exudate, the leaves are opposite, the leaf blade is similar to *Syzygium*, but the nervation is more open, less regular, and without the clear intra-marginal nerve. The twig is marked by a stipular ridge as in *Memecylon*. New leaves droop limply at first and are a remarkable blue color. Leaves accumulate aluminum and often dry yellow or blue-black. The flowers are bisexual or sometimes include a mix of bisexual and staminate flowers.

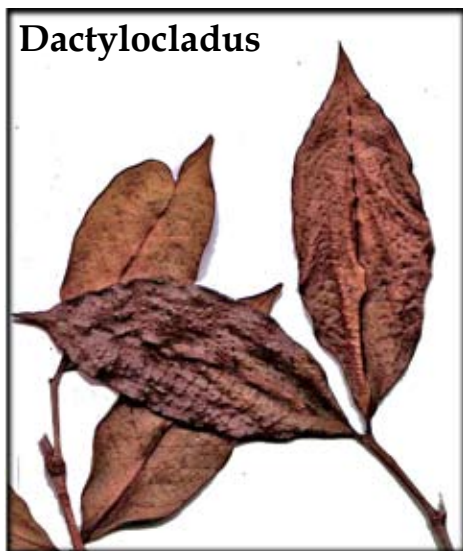
In *C. paniculata*, and perhaps all species, the first three internodes of the young twigs are inhabited by a tiny ant. Myrmecophytes are otherwise rare in the Myr-

¹Conti, E, *et al.* 2002. *Evolution*. 56: 1931-1942.

²Rutschmann, F, *et al.* 2004. *International Journal of Plant Science*. 165: S69-S83.



Crypteronia. 1-5, *C. griffithii*, Pasoh Malaya; 1, paired opposite leaves next to a 7 cm DBH tree; 2, the twig apex; 3-4, an ant emerges from the hollow twig, the entrance hole; 5, floral stalk; 6, *C. paniculata*, Bataan, Philippines; 7, diagram of flowers. (Photograph 7 © Ulysses Ferreras; drawing adapted from BAILLON *loc. cit.*)



Dactylocladus stenostachys, sterile voucher specimen K13423 from Brunei. (© Professor Eizi Suzuki.)

tales, and it would be interesting to know more about this mutualism. The ants are exceedingly small and do nothing by way of aggressively protecting the twig.

AXINANDRA. [Latin and Greek, in reference to the flowers in the leaf axils.] Sri Lanka claims one species, *Axinandra zeylanica*, and perhaps three others are found from Malaya to Borneo. The floral axis bears three bracts below each flower, the petals are said to fall away as a cap. The fruits are less than one cm broad and open to release small winged seeds. Little is known about these small plants of the forest understorey.



Axinandra. The photograph is from small tree from Lambir Hills, Sarawak, the flowers of which appear to be *Axinandra*, but not of the three known species. The leaves and twig can hardly be distinguished from *Memecylon*.

DACTYLOCLADUS. [Greek, branched like fingers, in reference to the inflorescence.] Monotypic, *Dactylocladus stenostachys*, an important Bornean timber of peat and other swamp forests, the tree and the timber both usually called *jongkong*. However, natural populations with large individuals are now exceedingly rare because most of Borneo's swamps have been cleared and drained for oil palm. The species is occasional in *kerangas*. It evidently flowers and fruits during every month. The floral axis bears a single bract below each flower, the petals fall away singly, the fruit a capsule with a persistent non-splitting style, the seeds winged.



ROSIDS: CROSSOSOMATALES

STAPHYLEACEAE

NAME: From the genus *Staphylea*, Greek for cluster, in reference to the inflorescence.

OVERVIEW: A small family of 45 species in two genera, disjunct in distribution with *Staphylea* in the North Temperate Zone and *Turpinia* across the tropics. The family as a whole comprises non-lactiferous trees bearing leaves of diverse form but with serrate margins and stipules that leave a prominent white scar at the node. The flowers are in axillary panicles, sometimes clustered terminally, bisexual (sometimes unisexual?) five-parted with distinct calyx and petals, stamens alternate with

petals, a superior ovary that bears several seeds, arillate or not, and matures as either an indehiscent berry (*Turpinia*) or an inflated capsule (*Staphylea*). Simmons points out that if the type species of *Turpinia* (*T. paniculata*) is transferred to *Staphylea*, then our trees revert in name to Roxburgh's *Dalrympelea*¹.

TURPINIA. [Commemorates P. Turpin, d. 1840, French botanical illustrator.] About 30 species found in tropical and temperate Asia and tropical America. In tropical Asia we find about six widespread species, two in Malaya, five in Borneo, four in the Philippines, two in Laos; China claims 13 species. Mostly small to large trees, not very tall but some to large diameters, evergreen or in temperate climates, deciduous. *Turpinia* are quickly recognized by the leaves which are strictly opposite, decussate, and pinnately compound with a terminal leaflet. The leaf rachis is distinctly articulated with swellings,

¹Simmons, S. 2007. The Families and Genera of Vascular Plants. 9: 440-445.